

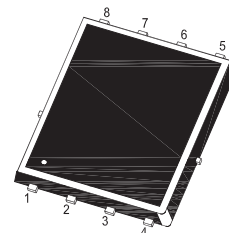
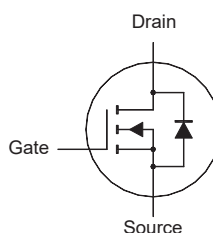
N-Channel Enhancement Mode MOSFET

Features

- Low Miller Capacitance
- Fully Characterized Capacitance and Avalanche
- Halogen and Antimony Free(HAF),
RoHS compliant

Application

- BLDC Motor drive applications
- Battery powered circuits
- Synchronous rectifier applications
- Resonant mode power supplies



1. Source 2. Source 3. Source 4. Gate
5. Drain 6. Drain 7. Drain 8. Drain
DFN5060 Plastic Package

Key Parameters

Parameter	Value	Unit
BV_{DSS}	100	V
$R_{DS(ON)}$ Max	4.5 @ $V_{GS} = 10\text{ V}$	m Ω
	6.6 @ $V_{GS} = 4.5\text{ V}$	
$V_{GS(th)}$ typ	1.7	V
Q_g typ	75 @ $V_{GS} = 10\text{ V}$	nC

Absolute Maximum Ratings(at $T_a = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	100	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current	I_D	80	A
		50	
Peak Drain Current, Pulsed ¹⁾	I_{DM}	480	A
Single Pulse Avalanche Current	I_{AS}	24	A
Single Pulse Avalanche Energy ²⁾	E_{AS}	144	mJ
Power Dissipation	P_{tot}	60	W
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to + 175	$^\circ\text{C}$

Thermal Characteristics

Parameter	Symbol	Max.	Unit
Thermal Resistance from Junction to Case	$R_{\theta JC}$	2.5	$^\circ\text{C/W}$
Thermal Resistance from Junction to Ambient ³⁾	$R_{\theta JA}$	50	$^\circ\text{C/W}$

¹⁾ Pulse Test: Pulse Width $\leq 100\text{ }\mu\text{s}$, Duty Cycle $\leq 2\%$, Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)} = 175^\circ\text{C}$.

²⁾ Limited by $T_{J(MAX)}$, starting $T_J = 25^\circ\text{C}$, $L = 0.5\text{ mH}$, $R_{\theta} = 25\text{ }\Omega$, $I_{AS} = 24\text{ A}$, $V_{GS} = 10\text{ V}$.

³⁾ Device mounted on FR-4 substrate PC board, 2oz copper, with 1-inch square copper plate in still air.

Characteristics at $T_a = 25^\circ\text{C}$ unless otherwise specified

Parameter	Symbol	Min.	Typ.	Max.	Unit
STATIC PARAMETERS					
Drain-Source Breakdown Voltage at $I_D = 1\text{ mA}$	BV_{DSS}	100	-	-	V
Drain-Source Leakage Current at $V_{DS} = 80\text{ V}$	I_{DSS}	-	-	1	μA
Gate Leakage Current at $V_{GS} = \pm 20\text{ V}$	I_{GSS}	-	-	± 100	nA
Gate-Source Threshold Voltage at $V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	$V_{GS(th)}$	1.2	-	2.4	V
Drain-Source On-State Resistance at $V_{GS} = 10\text{ V}$, $I_D = 50\text{ A}$ at $V_{GS} = 4.5\text{ V}$, $I_D = 20\text{ A}$	$R_{DS(on)}$	- -	3.5 -	4.5 6.6	$\text{m}\Omega$
DYNAMIC PARAMETERS					
Forward Transconductance at $V_{DS} = 5\text{ V}$, $I_D = 30\text{ A}$	g_{fs}	-	104	-	S
Gate Resistance at $V_{GS} = 0\text{ V}$, $V_{DS} = 0\text{ V}$, $f = 1\text{ MHz}$	R_g	-	1	-	Ω
Input Capacitance at $V_{GS} = 0\text{ V}$, $V_{DS} = 50\text{ V}$, $f = 1\text{ MHz}$	C_{iss}	-	3742	-	pF
Output Capacitance at $V_{GS} = 0\text{ V}$, $V_{DS} = 50\text{ V}$, $f = 1\text{ MHz}$	C_{oss}	-	698	-	pF
Reverse Transfer Capacitance at $V_{GS} = 0\text{ V}$, $V_{DS} = 50\text{ V}$, $f = 1\text{ MHz}$	C_{rss}	-	34	-	pF
Gate charge total at $V_{DS} = 50\text{ V}$, $I_D = 50\text{ A}$, $V_{GS} = 10\text{ V}$ at $V_{DS} = 50\text{ V}$, $I_D = 50\text{ A}$, $V_{GS} = 4.5\text{ V}$	Q_g	- -	75 40	- -	nC
Gate to Source Charge at $V_{DS} = 50\text{ V}$, $I_D = 50\text{ A}$, $V_{GS} = 10\text{ V}$	Q_{gs}	-	14	-	nC
Gate to Drain Charge at $V_{DS} = 50\text{ V}$, $I_D = 50\text{ A}$, $V_{GS} = 10\text{ V}$	Q_{gd}	-	22	-	nC
Turn-On Delay Time at $V_{DS} = 50\text{ V}$, $I_D = 50\text{ A}$, $V_{GS} = 10\text{ V}$, $R_g = 3.3\text{ }\Omega$	$t_{d(on)}$	-	26	-	ns
Turn-On Rise Time at $V_{DS} = 50\text{ V}$, $I_D = 50\text{ A}$, $V_{GS} = 10\text{ V}$, $R_g = 3.3\text{ }\Omega$	t_r	-	43	-	ns
Turn-Off Delay Time at $V_{DS} = 50\text{ V}$, $I_D = 50\text{ A}$, $V_{GS} = 10\text{ V}$, $R_g = 3.3\text{ }\Omega$	$t_{d(off)}$	-	23	-	ns
Turn-Off Fall Time at $V_{DS} = 50\text{ V}$, $I_D = 50\text{ A}$, $V_{GS} = 10\text{ V}$, $R_g = 3.3\text{ }\Omega$	t_f	-	8	-	ns
Body-Diode PARAMETERS					
Drain-Source Diode Forward Voltage at $I_S = 50\text{ A}$, $V_{GS} = 0\text{ V}$	V_{SD}	-	-	1.3	V
Body-Diode Continuous Current	I_S	-	-	80	A
Body-Diode Continuous Current, Pulsed	I_{SM}	-	-	480	A
Body Diode Reverse Recovery Time at $I_S = 50\text{ A}$, $V_{DD} = 50\text{ V}$, $di/dt = 200\text{ A}/\mu\text{s}$	t_{rr}	-	48	-	ns
Body Diode Reverse Recovery Charge at $I_S = 50\text{ A}$, $V_{DD} = 50\text{ V}$, $di/dt = 200\text{ A}/\mu\text{s}$	Q_{rr}	-	106	-	nC

Electrical Characteristics Curves

Fig. 1 Typical Output Characteristics

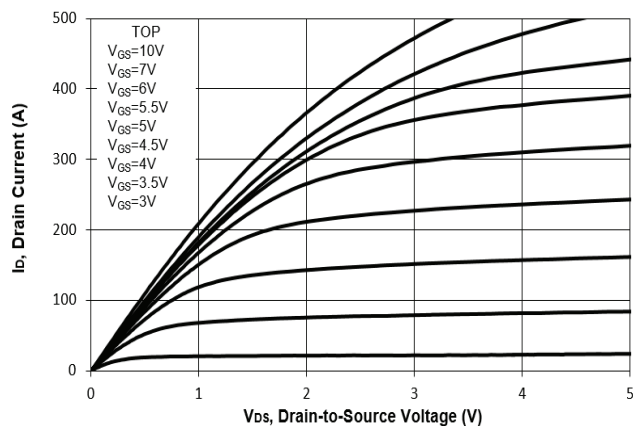


Fig. 2 Typical Transfer Characteristics

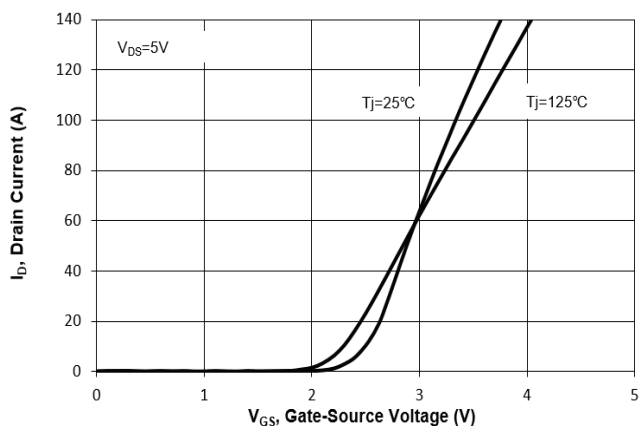


Fig. 3 on-Resistance vs. Drain Current

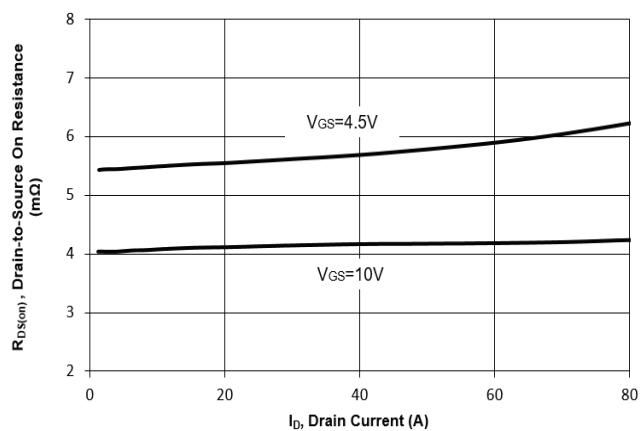


Fig. 4 on-Resistance vs. Gate to Source Voltage

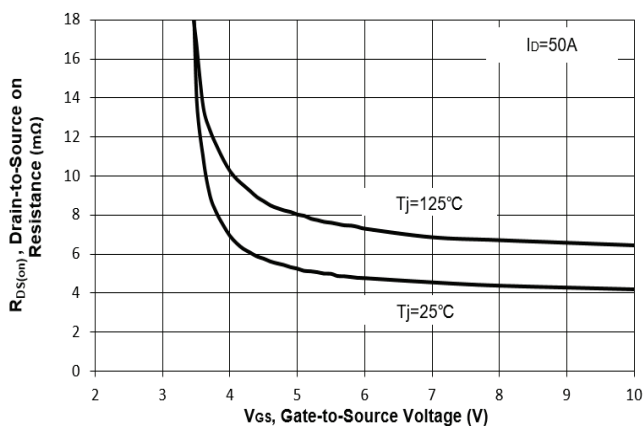


Fig. 5 on-Resistance vs. TJ

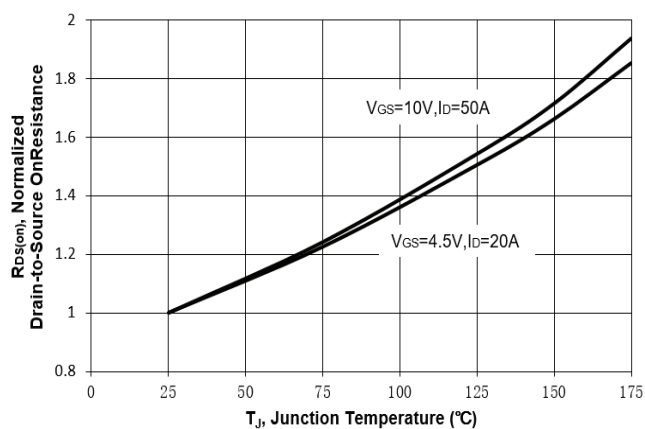
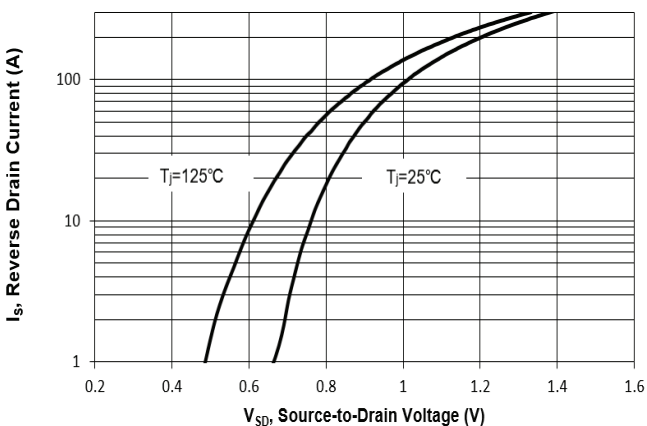


Fig. 6 Typical Body-Diode Forward Characteristics



Electrical Characteristics Curves

Fig.13 Normalized Maximum Transient Thermal Impedance($Z_{\theta JC}$)

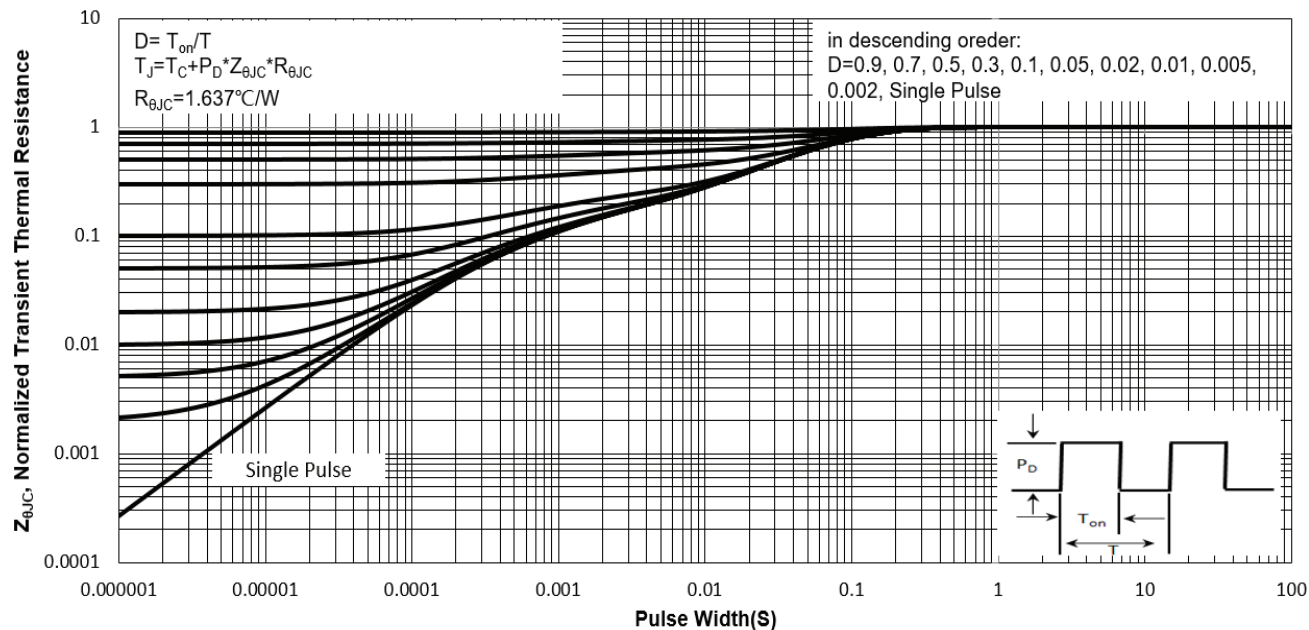


Fig.14 Normalized Maximum Transient Thermal Impedance($Z_{\theta JA}$)

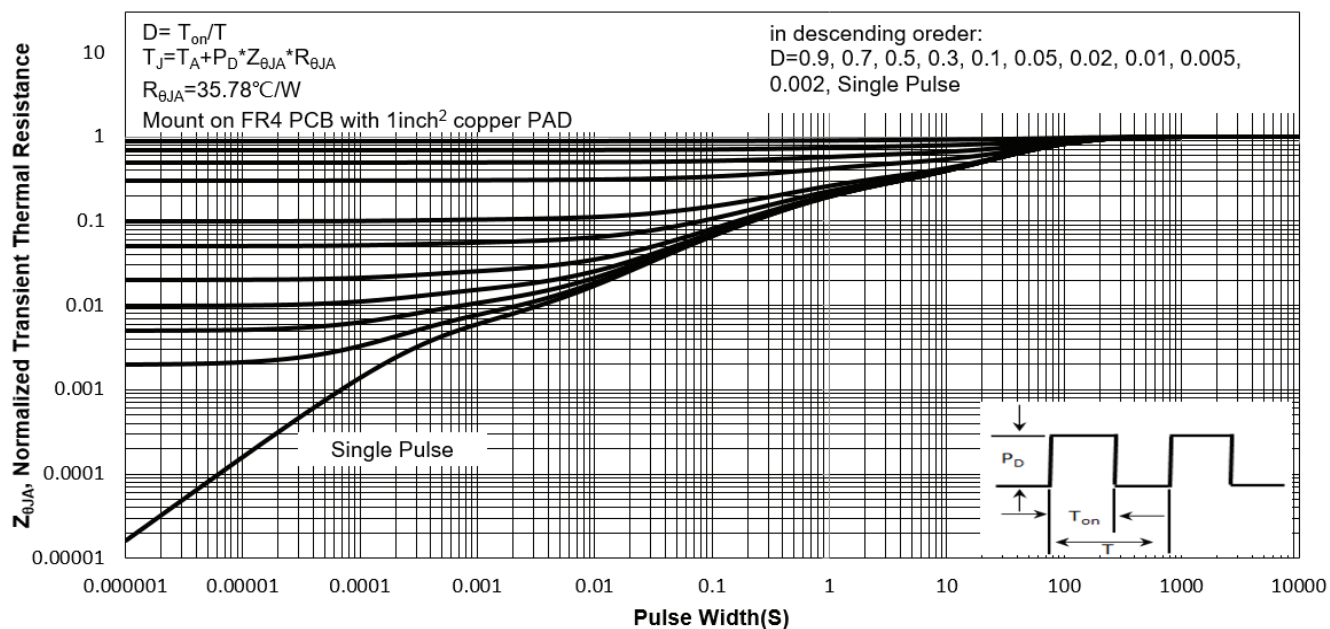


Fig. 7 Typical Junction Capacitance

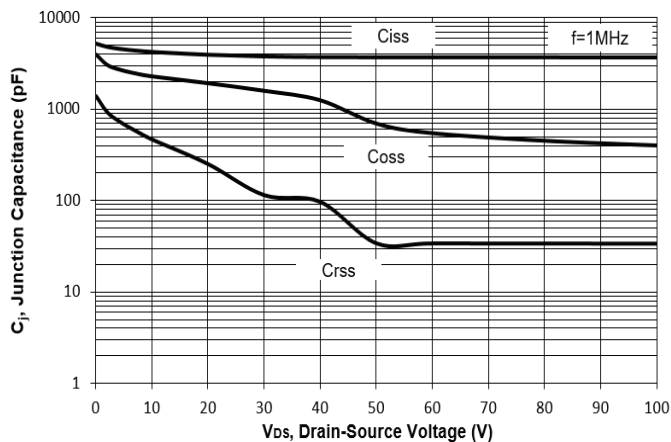


Fig. 8 Drain-Source Leakage Current vs. T_j

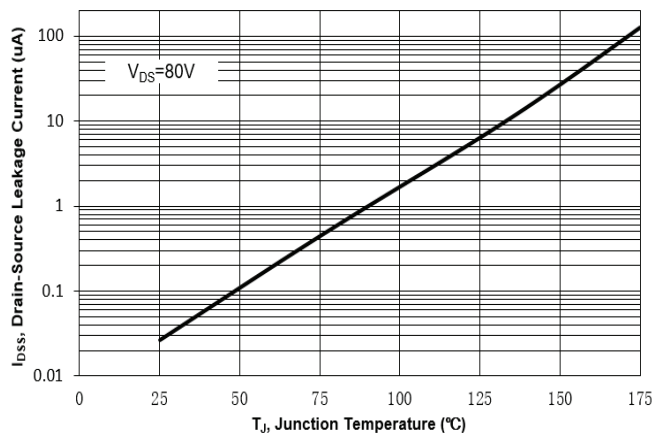


Fig. 9 $V_{(BR)DSS}$ vs. Junction Temperature

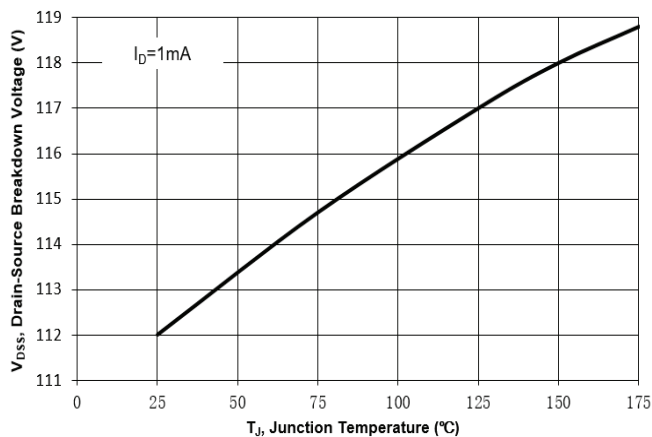


Fig. 10 Gate Threshold Variation vs. T_j

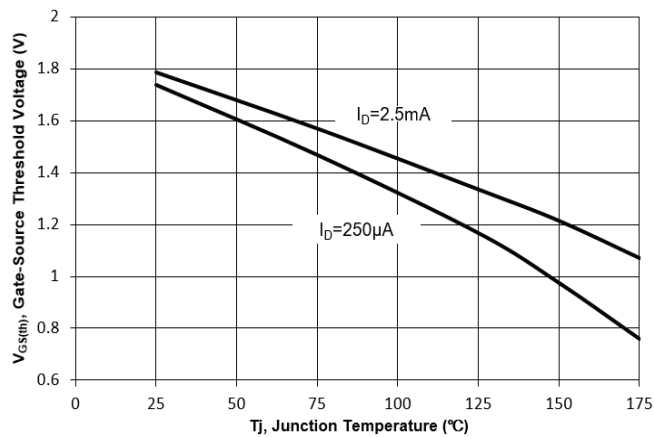


Fig. 11 Gate Charge

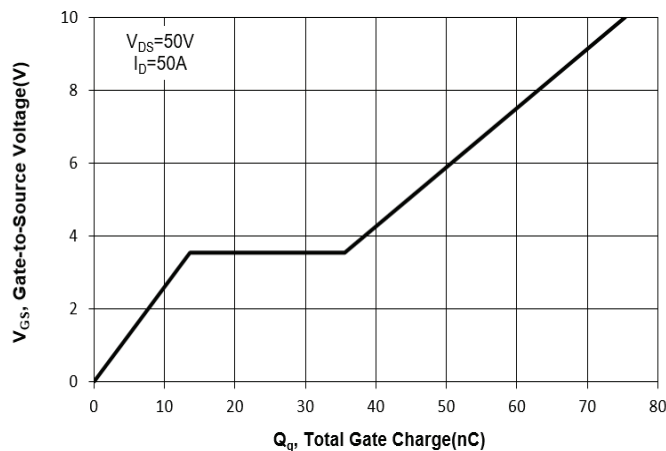
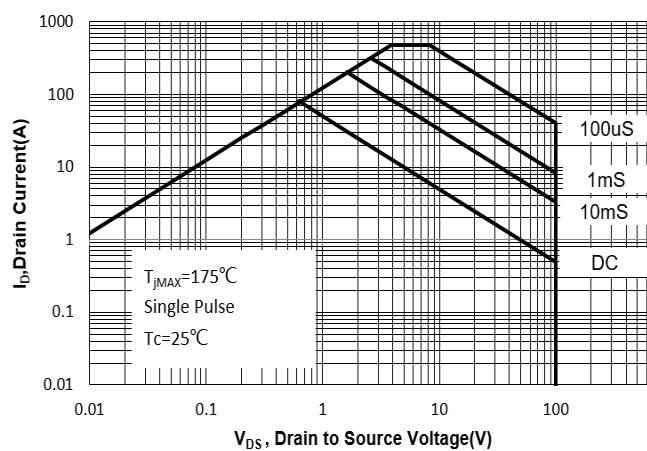
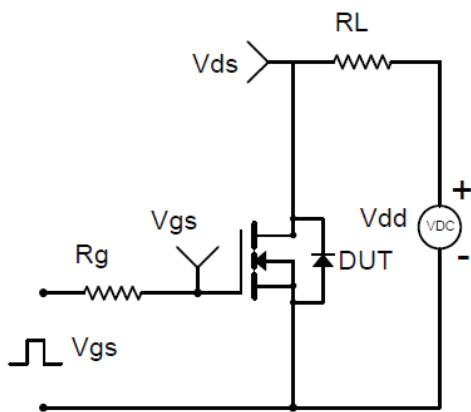
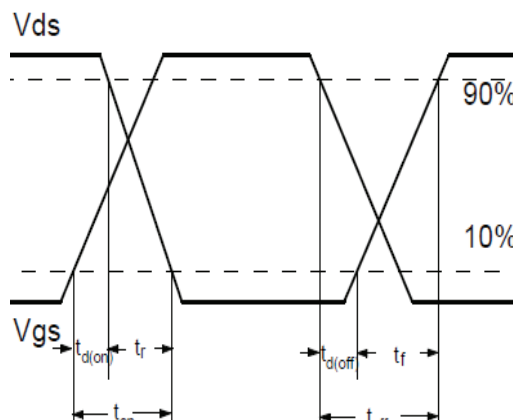
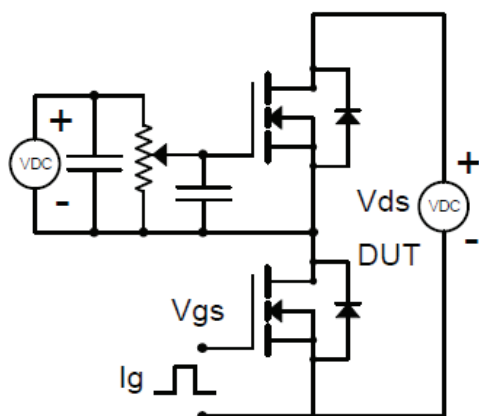
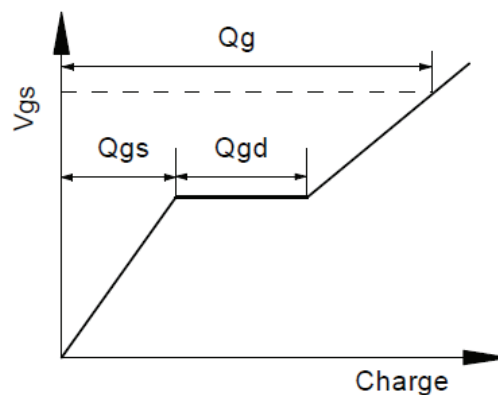
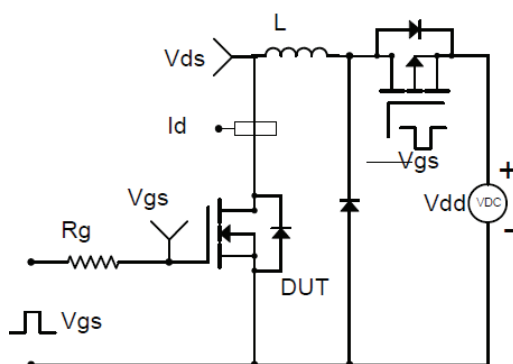
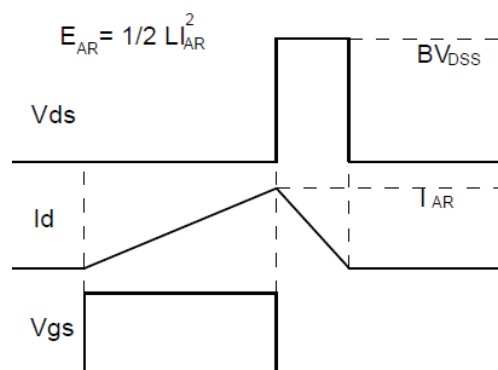


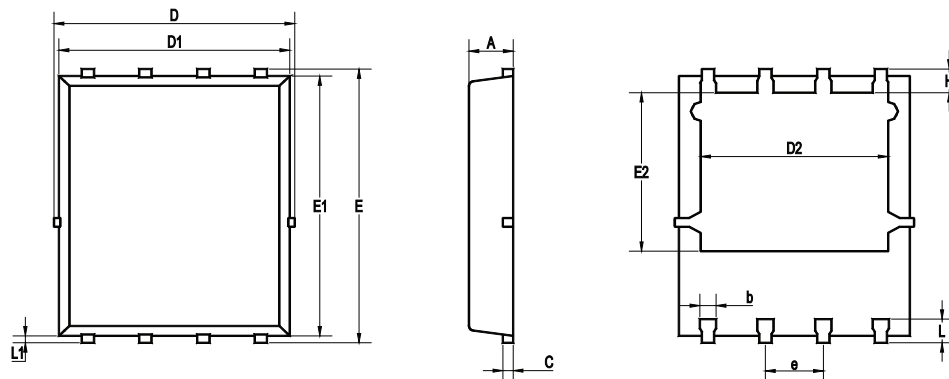
Fig. 12 Safe Operation Area



Test Circuits
Fig.1-1 Switching times test circuit

Fig.1-2 Switching Waveform

Fig.2-1 Gate charge test circuit

Fig.2-2 Gate charge waveform

Fig.3-1 Avalanche test circuit

Fig.3-2 Avalanche waveform


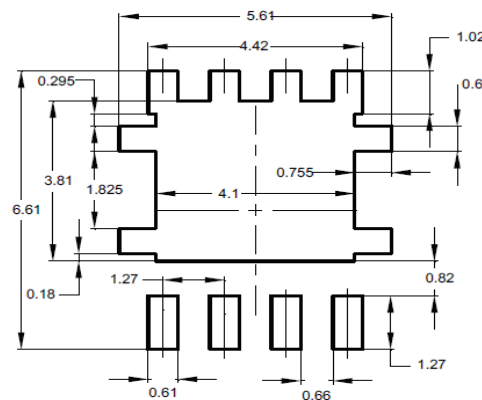
Package Outline Dimensions (Units: mm)

DFN5060



UNIT	A	b	C	D	D1	D2	E	E1	E2	e	L	L1	H
mm	1.12	0.51	0.34	5.26	5.1	4.5	6.25	6	3.66	1.37	0.71	0.2	0.71
	0.9	0.33	0.11	4.7	4.7	3.56	5.75	5.6	3.18	1.17	0.35	0.06	0.35

Recommended Soldering Footprint



Packing information

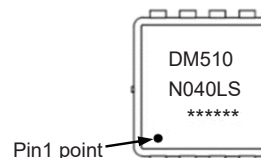
Package	Tape Width (mm)	Pitch		Reel Size		Per Reel Packing Quantity
		mm	inch	mm	inch	
DFN5060	12	8 ± 0.1	0.315 ± 0.004	330	13	5,000

Marking information

" DM510N040LS " = Part No.

" ***** " = Date Code Marking

Font type: Arial



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